What I claim as my invention is:

Claim 1. A method for resolving range ambiguities and separating ~~overlaid~~ signals in a Doppler weather radar, wherein said method comprises:

phase coding transmitted pulses from said radar with Chu's ~~a special~~ code, and

phase decoding of said coded pulses to make echoes ~~form~~ from a specified range ambiguous interval coherent, and

said decoding splits the spectrum from ~~overlaid~~ echoes from said range interval,

said spectra have the same shape but are offset from each other.

Claim 2. The method for resolving range ambiguities as claimed in claim 1, wherein a phase Ψ_k of the k^{th} transmitted pulse is determined by

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$$\Psi_k(q) = -\sum_{m=0}^{k} (n\pi/M) \sum_{p=0}^{2q} (m+p)^2 \; ; \; q=0,\ 1,\ 2,\ \ldots\ (M/2n-1), \quad k=0.\ 1,\ 2, \ldots L-1.$$

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Claim 3. The method for resolving range ambiguities and separating ~~overlaid~~ signals in a Doppler weather radar, wherein said method comprises:

transmitting a phase coded sequence,

for each range gate take a ~~the~~ time series sequence,

cohere a first trip echo,

multiply by a window weight,

filter a ~~the~~ ground clutter,

cohere a second trip echo,

autocovariance process said first and second trip echoes,

compute ~~the~~ ratio of estimated widths of the widths of said first and second trip echoes,

if said ratio is less than unity, said first trip echo is stronger than said second trip echo,

if said first trip echo is stronger than said second trip echo, process ~~the~~ time series samples in which the first trip echo is coherent,

if said second trip echo is stronger than said first trip echo, process ~~the~~ time series samples in which the second trip echo is coherent,

recover ~~the~~ power, mean Doppler velocity and ~~the~~ spectrum width of a ~~the~~ weaker trip echo,

compute a ~~the~~ spectrum width of a ~~the~~ stronger trip echo,

notch coefficients centered on a ~~the~~ mean Doppler velocity of the stronger trip echo,

compute a ~~the~~ mean power of the weaker trip echo,

compute a ~~the~~ mean power ratio of the stronger to weaker trip echo,

if the power ratio is less than 25dB, correct ~~the~~ error in the mean power of the stronger trip echo,

compute the corrected mean power of the stronger trip echo,

cohere the weaker trip echo in the spectrum,

compute autocorrelation for the cohered weaker trip echo, and

compute a ~~the~~ mean velocity of the weaker trip echo,

compute a ~~the~~ magnitude spectrum for the weaker trip echo,

multiply the magnitude spectrum for the weaker trip echo by a ~~the~~ de-convolution matrix,

compute autocorrelation for the weaker trip echo,

compute the spectrum width for the weaker trip echo,

display the power, mean Doppler velocity and spectrum width of the stronger trip echo and the weaker trip echo,

output the power, mean Doppler velocity and spectrum width of the stronger and weaker trip echoes and proceed to a ~~the~~ next range gate.

Claim 4. The method as claimed in claim 3, wherein the spectrum width of the weaker trip echo is an estimation, and

said estimation consists of magnitude domain spectral deconvolution, and

said deconvoluted spectra are processed to retrieve the spectrum width.

Claim 5. A method to filter ~~the~~ ground clutter from the signal samples of a Doppler weather radar using a staggered PRT transmission scheme for velocity ambiguity resolution, wherein said method consists of:

transmitting pulses with pulse repetition times T1 and T2 alternately,

inserting said signal samples with zeros to make ~~it~~ said signal samples a uniformly sampled sequence, and

then multiplying the uniformly sampled sequence by a ~~suitable~~ window function,

rearranging ~~the~~ spectral coefficients of a uniform sample sequence into a matrix $[V_r]$,

computing ~~a~~ clutter filter matrices $[C_{f1}]$ and $[C_{f2}]$, based on a code

sequence for a ~~the~~ T_1/T_2 ratio,

determining ~~the~~ clutter filter width in terms of ~~the~~ number of spectral coefficients,

multiply ~~the~~ column vectors of said matrix [V_r] ~~containing the clutter power~~ by said clutter filter matrix thereby obtaining a result, and subtracting the result from said column vectors.

Claim 6. A magnitude domain deconvolution procedure to reconstruct a ~~the~~ signal spectrum from signal samples of a Doppler weather radar using a staggered PRT transmission scheme for velocity ambiguity resolution, wherein said method comprises:

rearranging a matrix [V_r] into a column matrix and then carrying out a magnitude domain deconvolution, and wherein

said magnitude domain deconvolution consists of multiplying a signal spectrum magnitude [$|V|$] by an ~~the~~ inverse of the magnitude domain deconvolution ~~convolution matrix~~.

computing ~~the~~ mean velocity from the magnitude domain deconvolution ~~deconvolved spectrum,~~

deleting ~~the~~ residual coefficients and then estimating a ~~the~~ spectrum width and mean power.